

EXOTICS — REPTILES AND AMPHIBIANS

CARING FOR THE BEARDED DRAGON

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INTRODUCTION

The Bearded Dragon (*Pogona spp*), a native of Australia, is now found worldwide as a popular pet. Anecdotal reports indicate that it is starting to surpass the Iguana as the preferred pet reptile in the United States. In Australia, it is found widely distributed in the wild, although strict wildlife regulations mean that it is relatively uncommonly kept as a pet.

It is a member of the family *Agamidae* – the dragon lizards – a group of lizards found throughout the western Pacific, Australia, Indo-Malaysia, Asia and Africa. Characterized by a lack of autotomy (tail loss), the presence of tubercles and spines on juxtaposed scaled skin and a broad, flat fleshy tongue, this family is represented in Australia by the Bearded Dragon, water dragons, the Frilled Lizard and many other species. Most agamids are terrestrial, although a few are semi-arboreal. They are oviparous, usually laying their eggs in shallow burrows.

There are eight sub-species of Bearded Dragons:

1. *P. barbata* – the Eastern Bearded Dragon; found on the eastern coast of Australia.
2. *P. vitticeps* – the Central or Inland Bearded Dragon; found in western Queensland and New South Wales, eastern Northern Territory and eastern South Australia.
3. *P. minor minor* – the Dwarf Bearded Dragon; found over much of Western Australia.
4. *P. minor minima* – the Western Bearded Dragon; found down the western coast of Australia.
5. *P. minor mitchelli* – the North-West Bearded Dragon; found in north-western Western Australia across into the Northern Territory.
6. *P. nullabor* – the Nullabor Bearded Dragon; found in a small area on the Nullabor Plains on the border between Western Australia and South Australia.
7. *P. microlepidota* – the Kimberley Bearded Dragon; found in a small pocket in the Kimberley area in the north of Western Australia.
8. *P. henrylawsoni* – Lawson's Dragon (Rankin's Dragon, Black-soil Plains Bearded Dragon); found in north Queensland.

DESCRIPTION

The Bearded Dragon is a relatively large lizard, with a broad triangular head and a flattened body. Its tail is also relatively short and, as mentioned above, does not undergo autotomy. There are lateral spinose scales on either side of the tail base and on the flanks. The gular pouch on the ventral neck is expandable, giving rise to this dragon's name. This pouch is fringed with long

spikes. The mouth is usually a bright yellow color. Pre-femoral pores are found on the ventral thighs.

SEXING BEARDED DRAGONS

Bearded Dragons, especially juveniles, can be difficult to sex. Although cloacal probing has been described by some, sex is usually determined by external physical characteristics and behavior.

	Male	Female
Cloacal opening	Wide	Narrow
Base of tail	Wide	Narrow
Pre-anal and femoral pores	Large	Small
Head	Large, wide	Narrow, long
Hemipenes	May be everted	Absent
Beard	Large, black in color	Smaller, not as black
Behaviour	Aggressive, dominant, display beard	Not as aggressive or dominant, more likely to arm wave (see below)

THE BEARDED DRAGON IN THE WILD

Before discussing the care of Bearded Dragons it is appropriate to discuss their more natural lifestyle at home in Australia. Only by understanding the environment, diet, and social interactions that have shaped the evolution of this dragon can we hope to understand them in captivity and care for them properly.

Habitat

Australia is the world's largest island or its smallest continent, depending on your viewpoint. A journey from the coast to the centre will see a tremendous variation in landscape, from golden beaches, through lush rainforest, onto vast grasslands, scrub, rocky outcrops and gibber plains until the arid interior is reached. Along the way a traveler might encounter snow, floods, droughts, fire, and dust storms. The Bearded Dragon has evolved to survive and flourish in this kaleidoscope of backdrops.

The climate will also vary dramatically, depending on where in Australia the particular species comes from. The amount of rainfall ranges from the humid eastern coast, where annual rainfall averages 800 – 1600mm (31.5" – 63") to the more arid regions of central Australia where only 200 – 600mm (8" – 24") falls each year. The Bearded Dragon lives within these extremes, although very wet and very dry environments are usually avoided. The temperature varies widely as well, with daily

temperatures ranging between 15° - >30°C (60° – 90°F). Night time temperatures are often considerably cooler.

In these environmental extremes, vegetation will naturally vary. As a result, Bearded Dragons may be found in light forest, scrub and grasslands. Although they can be found in rocky or sandy areas, their semi-arboreal nature sees them preferring to live in areas with some trees. The settlement of Australia by whites seems to have had little impact on their distribution; it is still common to come across Bearded Dragons in cities and towns, on fence posts and around farm sheds.

Diet

Juvenile Bearded Dragons are predominantly insectivorous. As they grow, this dietary preference undergoes a change with the addition of leaves, berries, fruits and flowers. Although insects and even small vertebrates are consumed, adult Bearded Dragons are predominantly herbivorous (up to 90% of the diet).

They are often opportunistic feeders and will bask in the sun, moving only to pounce on a passing prey or devour a succulent plant or flower. Food taken can be determined by the season and time of year, with insects making up a larger proportion during certain periods.

Behavior

The behavior of wild Bearded Dragons has been extensively studied, with at least 73 different behavioral patterns observed. These behaviors include social, thermoregulatory and other general behaviors.

Bearded Dragons are a territorial reptile; males stake out large territories, with the hierarchy determined by body size. When two males come into contact, combat takes the form of beard displays, circling and tail biting. Within these male territories, females and juveniles maintain smaller territories. When they encounter a male, they generally adopt a submissive pose and slowly wave a forelimb through 360° while holding it out from the body (circumduction). Bearded Dragons also seem to exclude not only other Bearded Dragons from their territory (even those of different species) but also similar species such as Jacky Lizards (*Amphibolurus muricatus*).

Studies have indicated that the preferred body temperature for the Bearded Dragon is approximately 35°C (95°F). At this temperature their metabolism and digestive system appears to operate optimally. But, as indicated above, their natural environment only occasionally achieves that ambient temperature. These diurnal lizards have therefore adapted their behavior to meet this metabolic requirement. They are both shuttling heliotherms and thigmotherms, i.e. they both bask in the sun and absorb heat from warmed surfaces in their environment. To achieve this, Bearded Dragons are often seen perching on fence posts, dead trees and telephone posts. If the temperature rises above 35°C (95°F), they will move into the shade, or even seek shelter in shallow burrows. Their skin color may change, darkening as their body cools.

Brumation (torpor induced by prolonged spells of low temperatures) occurs in the south of Australia, where daytime temperatures in winter can often be below 10°C (50°F). Once the temperature gets into this range for more than a few days, the lizard seeks shelter under a rock, in a burrow, in a hollow log, under the base of a plant, or elsewhere. Its appetite is reduced or even absent, sometimes for 2-3 months. It may appear alert, although responding sluggishly to external stimuli. As the ambient temperature begins to rise in spring and is consistently above 12°C (54°F), the Bearded Dragon will become more active and resume its normal appetite.

When confronted by a predator, Bearded Dragons adopt a defensive posture; they open their mouth wide, displaying their yellow mucus membranes; the 'beard' is extended; the body is flattened – or inflated; and they darken their skin color. They will hiss at the intruder, and even make small jumps towards it. It should be noted though that this is a 'behavior of last resort' – Bearded Dragons much prefer to hide or move away when confronted.

Breeding

Bearded Dragons achieve sexual maturity between six and fifteen months; body size and growth rates are more important than age. Most Dragons are ready to breed when they reach 30cm (12") in length. Males are spermatogenic all year except for a period of brief regression in late summer. Females, on the other hand, are vitellogenic only in spring and early summer.

Courtship behavior begins in early spring, as day temperatures increase and the lizards become more active. The male initiates courtship. He approaches and circles the female, waving his arm, changing colour, extending his gular fold, bobbing his head and lashing his tail. Once she signifies acceptance by arm waving and head bobbing, the male grasps the female across back of neck & shoulders – in fact, he may even carry her around in this fashion. They then align their cloacas and the male inserts one of his two hemi-penes. The female signals the male to release by raising her head to a near-vertical position.

Short-term sperm storage can occur; related to male competition. The precise length of time is uncertain, although it does not extend between breeding seasons.

Egg laying occurs 2-3 weeks after mating. Prior to oviposition the female becomes quite enlarged in the abdomen, and spends more time basking. She may dig "test holes" prior to laying, but finally digs a shallow burrow, backs into it and lays her eggs, and then covers them loosely with dirt. She may return and defend her nest site for a few hours after laying, but finally abandons the nest site.

Females are generally receptive to males immediately after oviposition.

Each female usually produces 2-3 clutches per season, each of 14-26 eggs (up to 35 eggs have been recorded). Up to 7 clutches have been recorded in captivity. Clutch size varies according to species and age. Clutches may

overlap, i.e. the female may start to lay the next clutch before the first has hatched. This ability to lay multiple clutches is made possible by the presence of two germinal beds in each ovary (unlike many other lizard species). Each ovary contributes follicles to each clutch, and vitellogenesis begins in the second germinal bed even before the first clutch is laid.

Incubation

Bearded dragon eggs are incubated for 50 - 70 days at 29° C (84° F), and for longer periods at cooler temperatures. The eggs, 23 mm (1") long at oviposition, enlarge slightly during incubation, and hatch over 2-3 days. The hatchling dragons measure 9 cm (4") at hatch and are independent from the very start.

KEEPING BEARDED DRAGONS IN CAPTIVITY

Nearly all – if not all – health problems seen in captive Bearded Dragons are attributable to breakdowns in their husbandry. A good understanding of this reptile's requirements (as outlined above) and an understanding of how these can be met in captivity are essential if Bearded Dragons are to be kept successfully.

Enclosures

Where the climate is suitable (ie. similar to the Dragon's natural environment) Bearded Dragons are best kept outdoors, giving them access to natural sunlight and exercise. Requirements for an outdoor enclosure include:

- The enclosure should be sited in a well-drained location;
- As a minimum, a floor area of 8 feet² should be provided for up to 3 adults, with an additional 4 feet² for each additional dragon;
- Walls should be of a solid material, high enough to prevent escape, and buried in the soil to prevent the lizards burrowing out and rodents burrowing in. Wire mesh walls can lead to rostral abrasions as the lizards rub their noses on it.
- A wire mesh roof can prevent access by other animals, including cats and birds such as crows;
- Enclosure 'furniture' (rocks, branches, etc) should not be positioned so as to provide the Dragon with an escape route;
- Water bowls should be shallow with gentle sloping sides, allowing the Dragon escape should it fall in to the water;
- Shade and shelter should be provided;
- An area to brumate over winter should be provided – this may be a hollow log or an artificial cave, but in some climates a layer of leaf or litter may be sufficient;
- Only non-toxic plants should be provided. Rockery plants, grasses and clumping low vegetation are ideal. Avoid broad-leafed plants, as they tend to become very wet underneath their foliage;

In areas of high humidity or temperature extremes, it may be more suitable to keep Bearded Dragons indoors. While this allows more control over the Dragon's environment, the lack of sunlight and exercise can become an issue. Requirements for an indoor enclosure include:

- A large floor surface area is preferable to height. The minimum floor space for one dragon is 183cm (72") x 41cm (16") ;
- Walls should be of glass or sealed timber. Wire mesh walls can lead to rostral abrasion;
- Glass enclosures should be insulated on the base and on three sides to minimise heat loss;
- A branch should be provided to allow the Dragon to climb;
- Substrates should be easily cleaned or replaced, and preferably of a material unlikely to be ingested. Rock and sand are commonly used, but are often associated with gastrointestinal problems. Newspaper, while visually unappealing, has major safety and hygiene advantages.
- Heating, lighting and ventilation are essential – see below.

Lighting

Ultraviolet light is necessary for Bearded Dragons for calcium metabolism. Wherever possible, this should be provided by natural sunlight, unfiltered by glass or plastic. Full spectrum fluorescent lights manufactured for reptiles should be placed no more than 30 cm (12") above the lizard, and changed every 6-8 months. Basking lights, such as tungsten incandescent bulbs, can also provide some measure of UV radiation.

Being a diurnal lizard, it is important that a diurnal cycle be maintained. Lighting should be controlled by timers to give 12 – 14 hours light in summer, and 10-12 hours light in winter.

Heating

As mentioned previously, the Preferred Body Temperature (PBT) for Bearded Dragons is 35° C (95° F). Their Preferred Optimum Temperature Range (POTR – the range of temperature needed to maintain normal body functions) is 35° C to 39° C (95° F to 102° F). This can be attained by basking and by absorbing heat from flat surfaces. To this end, a basking light should be provided at one end of the enclosure to provide a temperature gradient between 29° C and 40° C (84° F to 104° F). Heat mats can be placed under half of the enclosure to assist in achieving this gradient. Heat rocks are not recommended because of the high incidence of thermal injury when using them. Night-time temperatures are usually a few degrees cooler, often attained by just turning the basking light off with a timer.

Humidity

High humidity is detrimental to the health of Bearded Dragons. Levels in the range of 30% to 40% should be the maximum in an enclosure. Excessive or broad-leafed

vegetation can trap moisture and increase humidity, and should therefore be avoided. Cages should be kept clean and dry. In areas of high humidity, it may be necessary to offer water only occasionally and for short periods.

Ventilation

Ventilation is essential to maintain health, but should not be such that difficulties are experienced in maintaining temperatures. Vents should be provided, but care needs to be taken to prevent rostral abrasions on the lizard. If necessary, the roof of an enclosure can be constructed of wire or mesh to allow adequate ventilation.

Hygiene

In an enclosed area the build up of pathogens can occur rapidly. Good hygiene is essential to prevent this. Feces and uneaten food should be removed daily, and substrate changed every 1-2 weeks. Indoor enclosures should be regularly cleaned and disinfected.

Feeding

Juvenile Bearded Dragons are predominantly insectivorous, and should be offered small crickets 2-3 times daily. They should also be offered finely chopped vegetables and fruit. These foods can be lightly dusted with calcium powder every second day.

Dragons become predominantly herbivorous as they reach maturity, and should be fed a diet of dark green leafy vegetables (Romaine lettuce, collard greens, endive, spinach, parsley, bok choy, broccoli), carrots, squash, beans and peas. This 'salad' should be offered every 1-2 days. Insects can be fed 2-3 times weekly, and a calcium supplement should be added once weekly.

Commercial diets are also available, but should not make up more than 50% of the diet. When these are fed, vitamin-mineral supplements should be reduced or discontinued.

Fireflies (*Photinus* spp), Monarch (*Donaus plexippus*) and Queen (*D. gillipus*) butterflies, and lygaeid bugs (*Oncelptus fasciatus*) have been reported as toxic to Bearded Dragons, and should be avoided.

Winter Care

Brumation in winter is still recommended for Bearded Dragons in captivity, with some authors suggesting that it may be necessary as a reproductive 'stimulant' in early spring. Decreasing the temperature under the basking light to 24°C to 27°C (75°F to 80°F) and the night time temperature to 16°C (60°F) for 4-6 weeks can replicate the natural environment.

As the ambient temperature drops, appetite and activity similarly decrease. Frequency and volume of feeding should be reduced during this period. Soaking the Dragon in lukewarm water 20 minutes every 1-2 weeks can help to prevent dehydration. Shelter (hollow logs, artificial caves, etc) should be provided.

As spring approaches the heat and light available to the lizard should be slowly increased over a few weeks. Once normal activity levels have resumed, normal feeding regimes can be reintroduced.

Care of Juveniles

Hatchling Bearded Dragons are miniature replicas of their parents, measuring 9-10cm (4") in length and weighing only 2-3 grams. They are independent and begin feeding by themselves within a few days. They can be housed individually or in small groups of similar sizes. Juveniles that are not keeping pace with the growth rates of their siblings should be removed to a less competitive environment.

Cages should be kept simple, with minimal furnishings that can conceal food items. Heating and lighting should be similar to adults. If possible, juveniles older than 8 weeks should be housed outdoors to gain maximum exposure to sunlight. If this is not feasible, juveniles should be exposed to unfiltered sunlight for 30-60 minutes every 1-2 days.

Juveniles should not be encouraged to brumate in their first winter.

Ecdysis

Ecdysis, the periodic shedding of the keratinised layer of skin, occurs in Dragons in a piecemeal fashion ie sections of skin peel away in variable sized sections over a few days. The frequency of this event is determined by species, age, growth rate, ambient temperature and food availability. During spring and summer, when they are active and perhaps growing rapidly, dragons shed more frequently – perhaps as often as monthly. During this time abrasive surfaces, such as rocks and branches, should be provided for the dragon to rub against to assist in removing shed skin.

COMMON PROBLEMS

Parasites

External parasites (mites and ticks) are occasionally reported in some collections. A variety of treatments have been reported; veterinarians should assess the potential toxicity of some chemicals if they are unfamiliar with their use.

Gastrointestinal parasites are common in Bearded Dragons. Pinworms, coccidia and flagellated protozoa are found in many Bearded Dragons. Their pathogenicity is sometimes debated, as they appear to play a symbiotic role with their host. However, captive Bearded may develop overwhelming parasitic loads as a result of environmental contamination. Treatment with drugs such as sulfadimethoxine (Albon® 25mg/kg SID 6 days, then 6 days off, 6 days on till cleared), oxfendazole (66mg/kg), toltrazuril (Baycox®, 5-15mg/kg SID 3 days) and metronidazole (40-160mg/kg q72hr) have been used successfully and safely in many Dragon collections.

Metabolic Bone Disease

Metabolic Bone Disease is, unfortunately, very common in Bearded Dragons, especially in juveniles. Lameness, soft 'rubbery' jaws, spinal deformities and 'failure to thrive' are common clinical signs. The patient's history will often lead the clinician to a probable diagnosis, which is usually conformed by radiology. Treatment requires dietary correction and the provision of UV radiation (preferably sunlight). Response to treatment is variable, and is dependent on the severity of the condition, the age of the patient, and the owner's willingness to implement husbandry changes.

Respiratory Infections

As with other reptiles, Bearded Dragons are prone to respiratory infections when housed in damp, cool conditions. Signs include wheezing, open-mouth breathing and nasal exudate. Treatment with appropriate antibiotics is usually required, but will not succeed unless husbandry changes are implemented.

Food Refusal

Bearded Dragons often refuse to eat in response to social or environmental stresses. They will also refuse food as they start to brumate – this should not be mistaken for a pathological condition. Bullying by a larger dragon, low ambient temperatures and over-ventilation have all been incriminated as potential causes. Removing the dominant dragon, increasing the ambient temperature and eliminating draughts often correct the problem.

If these corrective measures fail to improve the Dragon's appetite, further investigation is warranted. This may include faecal analysis, haematology, biochemistries, radiology or endoscopy.

Skin Disorders

Dysecdysis - difficulty in shedding keratinised skin – occurs occasionally when either ambient humidity is too low, or abrasive surfaces are not available. It may also occur in sick, dehydrated reptiles. Parenteral fluids, soaking the lizard in warm water, and wrapping it in a wet towel have all been recommended as means of assisting a Dragon to complete a shed.

Skin infections (bacterial and fungal) occur when cage conditions are unhygienic or wet. Skin blemishes, blisters and ulcers are common clinical signs. Treatment requires correction of husbandry, topical application of disinfectants (eg povidiodine) and occasionally systemic antibiotic therapy.

Yellow Fungus Disease is a recently described dermatomycosis in Bearded Dragons. Affected Dragons display patchy yellow discoloration and dysecdysis. Affected skin darkens and becomes necrotic, with underlying tissues also becoming necrotic. The necrosis may later extend further into other organs, resulting in death. The causative agent is the *Chrysosporium anamorph* of *Nannizziopsis vriesii* (CANV). It is a contagious infection, spreading readily through a colony. Isolation of affected Dragons and "pulse" therapy with itraconazole is the currently recommended treatment.

References and Recommended Reading

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